

Claims:

- 1) A process for the preparation of hollow structured freestanding membrane having pore size of in the range of 2 to 200 nm said process comprises the steps:
 - a) mixing a monomer with aqueous chloraurate ions in an organic solvent;
 - 5 b) polymerizing the mixture of step (a) for a time period in the range of 3 to 5 hours to obtain gold nanoparticles encapsulated free standing membrane,
 - c) treating the free standing membrane of step (c) with iodine solution for a time period in the range of 3 to 7 hours to leach out the gold nano particles thereby obtaining the hollow structured free standing membrane.
- 10 2) A process as claimed in claim 1, wherein step (a) the monomer is diamine having ethereal linkages.
- 3) A process as claimed in claim 2, wherein the diamine used is selected from a group comprising 2-bis (4-aminophenoxy) diethyl ether and DAEE ($C_{16}H_{20}N_2O_3$).
- 15 4) A process as claimed in claim 2, wherein the solubility of monomer in the organic solvent is in the range of $10^{-1}M$ to $10^{-5}M$.
- 5) A process as claimed in claim 1, wherein in step (a) the organic solvent used is hydrocarbons or substituted hydrocarbons.
- 6) A process as claimed in claim 5, wherein the hydrocarbon is selected from
20 hexane or benzene.
- 7) A process as claimed in claim 5, wherein the substituted hydrocarbon is toluene.
- 8) A process as claimed in claim 1, wherein the pH value of the mixture of step (a) is not greater than 3.
- 9) A process as claimed in claim 1, wherein the concentration of chloraurate ions
25 and the monomer is greater than $10^{-3}M$.
- 10) A process as claimed in claim 1, wherein the concentration of chloraurate ions is almost equal to the concentration of the monomer.
- 11) A process as claimed in claim 1 wherein in step (b), polymerisation of the monomer is carried out at liquid-liquid interface of organic and aqueous phases.
- 30 12) A process as claimed in claim 1, wherein the membrane has uniform pore size in the range of 50 to 100 nm.
- 13) A process as claimed in claim 1, wherein the as-prepared freestanding

membranes are stable for a time period of several years.

- 14) A process in accordance with claim 1, wherein said freestanding membrane contains polyaniline which is formed by cross linking of diamine monomers.
- 15) A process as claimed in claim 1, wherein leaching of gold nano particles is performed by using iodine-iodide solution.
- 16) A process as claimed in claim 1 wherein prior to step (c), the free standing membrane is optionally washed with distilled water.
- 17) A process as claimed in claim 15, wherein the iodine-iodide solution is prepared by dissolving iodine in potassium iodide solution.
- 18) A process as claimed in claim 1, wherein the leaching of gold nanoparticle is performed by floating thoroughly washed free standing membrane in the iodine-iodide solution to obtain hollow structured membrane.
- 19) A process as claimed in claim 1, wherein the gold nanoparticles are leached out in a time period in the range of 4-5 hours.
- 20) A process as claimed in claim 1, wherein the hollow structured free standing membranes have application in protein/enzyme immobilization, whole cell culture, biominerals growth, drug delivery etc.